

What is claimed is:

1. A laser system, comprising:
 - a molecular fluorine (F₂) gain medium disposed in a resonant cavity;
 - a power supply for exciting the gain medium to produce a laser beam having an ultra
 - 5 violet (UV) radiation output at substantially 157 nm and a red radiation output in a 620 to 760 nm wavelength range; and
 - a photo diamond detector that receives a portion of the laser beam for measuring at least one optical parameter of the UV radiation;
 - wherein the photo diamond detector is substantially insensitive to the red radiation
 - 10 output in the laser beam.
2. The laser system of claim 1, further comprising:
 - a controller for controlling the power supply, wherein the controller modifies the excitation of the gain medium by the power supply in response to the optical parameter
 - 15 measured by said photo diamond detector.
3. The laser system of claim 1, further comprising:
 - a laser tube for containing the gain medium, wherein the gain medium is gaseous;
 - a discharge module connected to the laser tube for adding and withdrawing gas to the
 - 20 gain medium; and
 - a controller for controlling the discharge module, wherein the controller modifies the gas added to and withdrawn from the gain medium in the laser tube by the discharge module in response to the optical parameter measured by said photo diamond detector.
- 25 4. The laser system of claim 2, further comprising:
 - a laser tube for containing the gain medium, wherein the gain medium is gaseous; and
 - a discharge module controlled by the controller and connected to the laser tube for adding and withdrawing gas to the gain medium;
 - wherein the controller modifies the gas added to and withdrawn from the gain
 - 30 medium in the laser tube by the discharge module in response to the optical parameter measured by said photo diamond detector.

5. The laser system of claim 4, wherein the optical parameter is UV radiation energy output, and the controller operates both the power supply and the discharge module to regulate and stabilize the energy output of the UV radiation in response to the UV energy output measured by said photo diamond detector.

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6. The laser system of claim 1, wherein the optical parameter is at least one of power level, pulse energy, energy dosage, and pulse waveform.

7. The laser system of claim 2, further comprising:

10 a beam splitter disposed in the laser beam to deflect the portion of the laser beam toward the photo diamond detector; and

a scattering plate disposed in the portion of the laser beam deflected by the beam splitter for diffusing the laser beam portion measured by the photo diamond detector.

15 8. The laser system of claim 9, further comprising:
metal mesh shielding disposed at a front face of the photo diamond detector for preventing EMI disturbance to the photo diamond detector.

20 9. The laser system of claim 8, wherein the metal mesh shielding has different mesh wire densities to adjust transmitted energy to the photo diamond detector.

10. The laser system of claim 1, wherein the photo diamond detector is mounted in a hermetically sealed housing.

25 11. A method of operating an F₂ molecular fluorine laser system having a gain medium disposed in a resonant cavity, comprising the steps of:
exciting a molecular fluorine gain medium to produce a laser beam having an ultra violet (UV) radiation output at substantially 157 nm and a red radiation output in a 620 to 760 nm wavelength range;

30 directing a portion of the laser beam to a photo diamond detector; and
measuring at least one optical parameter of the UV radiation using the photo diamond detector;

wherein the photo diamond detector is substantially insensitive to the red radiation output in the laser beam.

12. The method of claim 11, further comprising the step of:
modifying the excitation of the gain medium in response to the optical parameter
measured by said photo diamond detector.

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13. The method of claim 11, wherein the gain medium is gaseous and is contained
in a laser tube, the method further comprising the step of:

adding and withdrawing gas from the laser tube in response to the optical parameter
measured by said photo diamond detector.

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14. The method of claim 12, wherein the gain medium is gaseous and is contained
in a laser tube, the method further comprising the step of:

adding and withdrawing gas from the laser tube in response to the optical parameter
measured by said photo diamond detector.

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15. The method of claim 14, wherein the optical parameter is UV radiation energy
output, and wherein modifying step and the adding/withdrawing step are performed to
regulate and stabilize the UV radiation energy output in response to the UV energy output
measured by the photo diamond detector.

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